



Research
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A mini-combine for sub-Saharan Africa



Evolving machine. The PhilRice–Briggs & Stratton prototype mini-combine has undergone a number of changes. It has achieved some success in Asia and has been retooled to fit African conditions.

Agricultural mechanization has been responsible for massively increasing production, productivity, and profitability. It is also an important factor that improves the lives of small-scale farmers. However, previous attempts at introducing machines to African farmers were not always successful. AfricaRice, IRRI, and their partners are now turning to holistic programs that ensure sustainable, affordable mechanization suitable to the scale of operations and skills of the small-scale farmers of Africa.

“We cannot make any significant improvement in rice production in sub-Saharan Africa without injecting some mechanization along the value chain,” says Dr. John Manful, AfricaRice grain-quality specialist. This statement reflects the opinion

of the Center that mechanization is essential for rice production and processing.¹

Building on the success of the ASI thresher-cleaner in the late 1990s and early 2000s, AfricaRice has been searching for harvesting machinery appropriate for small farmers. In 2009, Dr. Marco Wopereis, AfricaRice deputy director general “discovered” through IRRRI the Philippine Rice Research Institute (PhilRice)– Briggs & Stratton rice mini-combine produced by PhilRice. The machine is designed for small paddy fields and combines the four processes required at the end of the cropping season—harvesting, threshing, winnowing, and bagging.

Asian machine, African ingenuity

“The mini-combine is essentially a very simple machine,” explains AfricaRice agronomist Mamadou Kabirou N’Diaye. But, it had its limitations. “We discovered during the first tests that it got jammed by the straw of Senegal River Valley (SRV) rice,” he added. In Mali, the mini-combine also became jammed with the local straw.

This looked like a job for Malick Ndiaye. Mr. Ndiaye, the pioneer artisan in the adaptation of the ASI in

the mid-1990s, was able to modify the machine’s cutting system, threshing wheel, and elevator to handle the tougher rice straws. The original three-wheel design of the machine was also modified to four wheels to add stability and for easier transportation.

The improved machine was then put through its paces in terms of throughput (how much rice it could harvest and process in a set period of time) and losses, and compared with hand harvesting and threshing both physically and economically. At field demonstration days in 2010, partners noted that the mini-combine was both quicker and cleaner than manual harvesting and threshing.

Reaping approvals

The PhilRice prototype was further tested in a farmer’s demonstration field during the wet season of 2011 in Dagana in the SRV. Farmers appreciated the machine because of its speed and smaller losses compared with hand harvesting and big combine-harvesters. The mini-combine also underwent economic analysis in comparison with other machines available in the region. Hand harvesting and ASI threshing take double the time that the mini-combine does. Typically, they require eight people to do the work com-

¹AfricaRice. 2011. *Lessons from the rice crisis: Policies for food security in Africa*. p. 16.

Farm mechanization in Africa



A lack of mechanization has seriously limited the productivity and competitiveness of rice-based systems in sub-Saharan Africa (SSA). At present, more than 99% of all tasks on SSA rice

farms are undertaken using human or animal power. Workforce shortages at critical times have meant that crops are rarely planted or harvested on time. Postharvest losses are far too high and grain quality is often compromised during storage, handling, and processing.

However, all the countries of this region have large graveyards of old rusting farm equipment, purchased or imported with the best of intentions, but now a legacy of “inappropriate mechanization.”

For more information, see IRRRI’s 2011 Annual Report.

pared with the two or three for the mini-combine.

“With some training, our community could use, manage, and maintain the machine to get the maximum benefit from it,” said Mr. Djigo, a farmer from the nearby village of Bokhol.

Building confidence and farm machines

This was a good start, but the whole philosophy is to have local artisans not simply adapt the machine itself, but to adapt the design and fabricate it themselves. Could Mr. Ndiaye reproduce the mini-combine from scratch?

“Ndiaye was up to the task,” says Dr. N’Diaye. “We have a locally adapted, locally manufactured mini-combine ready for testing in 2012.”

If successful, AfricaRice will promote the machine in other countries in sub-Saharan Africa and Mr. Ndiaye will play a key role as a trainer of local artisans, just like he did with the ASI. He will teach artisans from Mali, Mauritania, Burkina Faso, and Ghana to fabricate and maintain the machines.

“With new funding from Canada,² we plan to organize the artisans who will manufacture the mini-combine,” says Dr. N’Diaye. “We will create a small network of trainers who can go on to instruct other manufacturers in the construction of the machines.”

² “Enhancing food security in Africa through the improvement of rice postharvest handling, marketing, and the development of new rice-based products,” a project funded by the Canadian International Development Agency that started in 2011.